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Progress in the implementation of the Programme of Action for the Sustainable Development of Small Island Developing States

Report of the Secretary-General

Addendum

Climate change and sea level rise*

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I. Introduction

1. The present report reviews the efforts made to address the concerns of small island developing States with regard to climate change and sea level rise. It seeks to identify actions that have been taken nationally, regionally and globally to address those problems; identify gaps and factors deemed responsible for inaction to date; and suggest areas where concentrated efforts are needed in the future.

II. Current situation and future prospects

2. In 1995, the Intergovernmental Panel on Climate Change examined evidence on climate change. They concluded that global mean surface air temperature has increased by about 0.3-0.6°C since the late nineteenth century. Analysis of trends in sea surface temperature produce similar results. They also noted that the mean temperature through the twentieth century has been at least as warm as in any century over the last 600 years. Based on these and other analyses, the Panel concluded that the balance of evidence suggests a discernable human influence on climate. Because the populations, agricultural land and infrastructure of small island developing States tend to be concentrated in the coastal zones, they are especially vulnerable to climate change, particularly to the resulting sea level rise.

3. The 1995 IPCC assessment of changes in sea level provides observational evidence on sea level trends associated with possible climate change. Recent analyses of the climate record suggest that the global mean sea level has risen 10 to 25 cm over the last 100 years. The rise in sea level over the past century due to thermal expansion is estimated to be 2 to 7 cm, while that due to melting of glaciers and the ice caps is in the range of 2 to 5 cm. The evidence on the net contribution from the ice sheets is too weak to support any firm conclusions. There is similar uncertainty with respect to land and groundwater, although their contribution is estimated to be small.

4. Climate models are increasingly being used as tools to aid the understanding of climate change and to make future projections. They attempt, within the limits of current scientific knowledge and the capacity of current computers, to represent the complex physics and dynamics of the earth-atmosphere-ocean-land-ice systems. The ability of such models to simulate past and present climate has been improving, and they are being used with increasing confidence to understand natural and possibly human-induced climate change. Many such models now include sea level as one of the variables, though it can also be estimated a posteriori.

5. The models are predicting an increase in global mean surface air temperature of about 2°C over the next century. Uncertainties in greenhouse gas emission rates and model limitations lead to uncertainties in projected climate change impacts as well. For example, the large capacity of the oceans to absorb heat as well as regional sensitivities lead to significant variations from this mean value around the globe. The slow response of the oceans to absorbed heat also allows for considerable heat buffering, thereby delaying the impact of heating.

6. Such models have been used to project changes in sea level. Depending upon the particular scenario being used and model uncertainties, the best estimate value of sea level rise, taking into account water expansion due to heating and glacial and polar melting, is about 50 cm over the next century, with a range of 13 to 94 cm. Most of this projected rise is attributed to thermal expansion. The rise will probably not be uniform given the differential response of the oceans to heating and circulation changes. Changes in variability, changing intensities and/or frequencies, the effects of El Niño etc. are also potential variables. However, they are difficult to predict with any confidence.

7. The potential socio-economic impacts of climate change on small island developing States are the subject of many studies of vulnerability carried out on the basis of the IPCC common methodology. Small island States are characterized by highly diverse ecosystems that are important as a source of food and as habitat for many species. Studies suggest that overexploitation of resources has led to a loss of resilience in small island developing States in coping with climate change and concomitant sea level rise. Depending on the scenario used (one metre sea level rise in most cases), the studies suggest that sea level rise would have negative impacts on tourism, freshwater supply and quality, aquaculture, agriculture, human settlements, financial services and human health in small island developing States. Storm surges are likely to have a harmful impact on low-lying small island developing States, leading to costly investments in protective measures. In addition, low-lying deltaic and burier coasts and low-elevation reef islands and coral atolls are especially vulnerable to a rising sea level, as well as to rainfall, storm frequency and intensity. Inundation, flooding, erosion and intrusion of sea water are among the likely impacts. Such impacts would affect productivity in small island developing States and seriously compromise their economic well-being.

Any shifts in rainfall regimes – especially if tropical cyclones increase in intensity and frequency – will also seriously disrupt the lives of small island developing States populations. Parts of the very low-lying islands not protected by sea walls could be submerged by only a one-metre rise in the sea level resulting from any storm surges.

8. The costs of responding to climate change depend on the options considered. They include (a) prevention: striving to prevent climate change; (b) adaptation: emphasizing strategies and measures for reducing expected damages; and (c) policies: indirectly inducing reduced emissions of greenhouse gases. Although there are no accurate estimates of costs of protection against climate change in small island developing States per se, IPCC estimates that adaptations to climate change could lead to an average cost approximately equal to 0.43 per cent of gross domestic product of most developing countries. For the Caribbean small island developing States, IPCC has projected the costs of new construction of protection alone at US$ 1.1 billion (1990).

III. Actions at the national and regional levels

A. National action

9. There have been varying degrees of national-level efforts within small island developing States. Most island countries have ratified the United Nations Framework Convention on Climate Change, and are acting to ensure compliance through a coordinated series of projects (see sect. IV below). Some countries, such as Fiji, Marshall Islands and Micronesia, are undertaking studies of greenhouse gas sources and sinks, with assistance from the United States Country Studies Program. Comprehensive and coordinated support to all Pacific island Parties to the Convention will be provided under the Global Environment Facility (GEF)-funded Pacific Islands Climate Change Assistance Project, which will assist countries in meeting their national reporting obligations under the Convention.

10. Broad strategic directions related to climate change are covered in the national environmental management strategies of most Pacific small island developing States. In some cases, specific policies or strategies for climate change are being developed; in others, they are being integrated into coastal management plans. National workshops have been held in Vanuatu, Solomon Islands, Samoa, Niue and Micronesia, focusing on developing policy and planning for climate-related damage in general, rather than solely on climate change. The United Nations Environment Programme (UNEP) is supporting a study on country case studies on climate change impacts and assessment and adaptation in Cuba, with financial support from the Government of Denmark. Additional UNEP small island developing States-related activities include projects to assist small island developing States in preparing their national communications for the Convention; the countries involved are Niue and Mauritius, and proposals for similar enabling activities in Cuba, Haiti, Comoros and the Dominican Republic are also in the preparation stage.

11. Many small island developing States have operational climate data-collection systems. For example, the South Pacific Regional Environment Programme (SPREP) is developing a programme to enable countries to collect, analyse and interpret meteorological data. As part of the South Pacific Sea Level Rise Monitoring Project (funded by Australia), gauges to monitor sea level have been established in 11 countries in the South Pacific.

12. Studies in 12 Pacific island countries, designed to assess where impacts are likely to be greatest, have also been carried out on the basis of geographical, physical, social and economic indicators. In addition, studies of vulnerability to erosion have been conducted in Fiji and Kiribati, and in-country seminars on coastal monitoring have been held in Tuvalu, Kiribati and Samoa.

13. Little work has been undertaken to develop detailed strategies for adaptation in small island developing States at the national level. Ongoing work to determine vulnerability to climate change and to meet national reporting obligations under the Convention will provide an essential foundation for such strategies. These strategies will be linked to activities for strengthening the integrated coastal management capacity of small island developing States.

B. Regional action

14. Small island developing States have a strong sense of common purpose in their quest to address the causes and impacts of climate change. A network of climate change focal points has been established in the Pacific, and SPREP continues to coordinate climate change activities, including through workshops. To date, the most significant initiative seeking to address the issue of climate change is that arising from the Caribbean Planning for Adaptation to Global Climate Change (CPACC) project being funded by GEF. Participating small island developing States include Antigua and Barbuda, Bahamas, Barbados, Belize, Dominica,

Grenada, Jamaica, Saint Kitts and Nevis, Saint Lucia, and Trinidad and Tobago. The overall project objective is to support Caribbean countries in preparing to cope with the adverse effects of global climate change, particularly sea level rise, in coastal and marine areas, by means of vulnerability assessment, adaptation planning and capacity-building linked to adaptation planning.

15. A Caribbean ministerial meeting held in November 1997 on the programme of action for the sustainable development of Caribbean small island States recommended that the Caribbean States:

(a) Support the continuing work of IPCC in studying the science and impacts of global climate change;

(b) Fully incorporate climate change considerations in their national long-term development planning process;

(c) Coordinate the execution of national communications required by the Convention among Caribbean small island developing States, by exchanging experiences and lessons;

(d) Request the Caribbean Community and the Organization of American States to support Caribbean States in developing their scientific and technical capacity, and the use of scientific information being generated by CPACC for development policy formulation, and in strategic forward planning to mitigate the impacts of climate change;

(e) Support development of the necessary institutional mechanism to ensure that critical programmes initiated under CPACC are sustained beyond the lifetime of the project.

16. Other regional activities have been carried out under the UNEP Regional Seas Programme. Task teams have been established to study the implications of climate change in East Africa, West and Central Africa, the Mediterranean, the South-East Pacific, the South Pacific, East Asia, South Asia, and the Kuwait Action Plan region. Each task team has produced a report on the implications of climate change on coastal areas of countries, including small island developing States, in the respective regional seas programmes. A synthesized report was subsequently prepared by UNEP on the basis of a workshop involving all the task team leaders.

IV. International action

17. Within their mandates, a number of international organizations and United Nations agencies have taken initiatives to help small island developing States to respond to climate change and sea level rise. The World Health Organization, the World Meteorological Organization (WMO), UNEP and the United Nations Educational, Scientific and Cultural Organization (UNESCO) and its Intergovernmental Oceanographic Commission (IOC) are among the agencies carrying out activities of relevance to small island developing States. The United Nations Framework Convention on Climate Change provides for a financial mechanism to assist non-annex I Parties to meet their obligations under the Convention.

A. Scientific understanding of climate change and sea level rise and their impacts

18. The World Climate Research Programme which is co-sponsored by UNESCO/IOC, WMO and the International Council of Scientific Unions, is carrying out major research projects, such as (a) a world ocean circulation experiment, which is designed to determine how the oceans work and what changes (e.g., sea level changes) are currently occurring; and (b) a climatic variability project (CLIVAR), designed to determine how the oceans (including the sea level) and the atmosphere vary naturally over time. UNEP has established a working group on the El Niño Southern Oscillation (ENSO) to examine the potential of using ENSO forecasts in early warning systems for famine, and how it could be utilized to forestall the adverse impacts of climate variability. UNEP is also examining the implications that climate change may have for the frequency and intensity of ENSO-related events and their impacts on socio-economic systems.

19. A working group on climate change detection and attribution has been established jointly by CLIVAR and the WMO Commission for Climatology to provide a firm scientific base for making assessments on the current rate of global climate change and its manifestations at the regional level.

B. Activities related to the implementation of the United Nations Framework Convention on Climate Change

20. GEF is to provide new and additional grant and concessional funding to meet the agreed incremental costs of measures to achieve agreed global environmental benefits in climate change. The GEF operational strategy provides three categories of activities in the area of climate change: (a) long-term measures; (b) enabling activities; and (c) short-term mitigation projects.

21. Long-term measures include three operational programmes: (a) removing barriers to energy conservation and energy efficiency; (b) promoting the adoption of renewable energy by removing barriers and reducing implementation costs; and (c) reducing the long-term costs of low greenhouse gas-emitting energy technology. Enabling activities specific to support national communications include stage I adaptation activities under the Convention. Short-term mitigation projects are intended to facilitate reductions in greenhouse gas emission in the short term.

22. Enabling activities in small island developing States financed by GEF include one regional project on regional planning for adaptation to climate change. This project supports countries in preparing to cope with adverse effects of climate change, particularly sea level rise. GEF funds granted for enabling activities in small island developing States totalled US$ 12.42 million as of December 1997. It is worth mentioning that some small island developing States participate in a number of global projects on enabling activities, such as the Global Change System for Analysis, Research and Training; climate change capacity-building; country case studies on climate change impacts and adaptation assessment, phase I, implemented by UNEP; and a project on capacity-building and infrastructure concerning participation in the assessment, methodology-development and other activities of the Intergovernmental Panel on Climate Change, implemented by UNEP in collaboration with the IPCC secretariat. GEF has also provided funding to small island developing States in the area of environmentally sound energy development totalling US$ 7.1 million, which has subsequently leveraged more than US$ 60 million.

23. Under the coordination of SPREP, Pacific island countries are participating in and contributing to international programmes, such as a Pacific ENSO centre, an atmospheric radiation measurement project and a South Pacific sea level rise monitoring project.

C. Monitoring activities

24. A number of monitoring programmes are directed to establishing signals of climate change and to providing the missing gaps in the understanding of the physics of atmosphere-land-ocean-ice interactions. For example, the Global Ocean Observing System (GOOS) is designed to monitor the present nature of the oceans, forecast how its conditions may change and provide the underpinning climate change forecasts. The climate component of GOOS is the ocean component of the Global Climate Observing System. Under the GOOS umbrella, sea level is measured by a global array of 300 time gauges deployed by individual nations in coastal regions on islands and in the open ocean. These are managed through the Global Sea-level Observing System (GLOSS). The GLOSS database shows that in many places around the world, sea level is rising in agreement with IPCC predictions, and satellite measurements confirm those findings. The present rise in sea level is due chiefly to thermal expansion of the upper ocean, apparently caused by global warming. The rise will continue as warm water from the surface sinks to warm the deeper layers of the ocean. Overall, a rise of some 50 cm over the next 50 years is predicted by IPCC.

25. The WMO Global Climate Monitoring System is providing synthesized information on the state of the climate system and diagnostic insights into significant large-scale anomalies with regional and global consequences. This particular project has enhanced predictions of ENSO events, and should provide a basis for understanding the impact of climate change for small island developing States in terms of the frequency, intensity and impact of ENSO events.

V. Recommendations for future action

A. At the national level

26. All the above considerations, in particular adaptation strategies relating to climate change and sea level rise, should be incorporated in long-term development planning processes.

27. Adequate human resources and institutional capacity should be built to absorb and adapt the findings of current projects on planning for adaptation to climate change and sea level rise currently under implementation in some small island developing States, and preventive and remedial measures should be taken in order to minimize and mitigate the impacts of climate change and sea level rise.

B. At the regional level

28. Effective institutional capacity should be established for all small island developing States regions to undertake activities related to the modalities of effective and efficient adaptation to climate change and sea level rise. Where such capacity exists, it needs to be further strengthened.

29. Projects on planning for adaptation to climate change should be implemented in all small island developing States

regions, with the provision to sustain them on a long-term basis, and help should be provided to develop the scientific and technical capacity of small island developing States to formulate and implement effective strategies and policies to minimize or mitigate the impacts of climate change and sea level rise. Where such activities have been initiated, they must be sustained.

C. At the international level

30. Further research should be facilitated on the regional and temporal responses of sea level rise, taking account, if possible, of changes in the frequency, intensity and location of higher-frequency and smaller-scale phenomena.

31. Further research should be facilitated on the contributions of ice sheets, glaciers and land and ground water storage to sea level change.

32. Adequate financial and technical assistance should be provided to help small island developing States to build human-resource and institutional capacity at the national and regional levels for coping with the impacts of climate change and sea level rise.

33. The resources of the relevant regional small island developing States institutions responsible for implementing projects on adaptation to climate change and sea level rise should be supplemented, as necessary.

34. The establishment of an observing system for generating data sets to improve model predictions of climate change and to help direct future impacts on small island developing States should be facilitated. Such a system should include:

(a) A high-accuracy altimeter to measure spatial variations and monitor temporal variability and trends in sea level rise;

(b) Sufficient (about 30) open-ocean gauges to monitor and eliminate trends in the altimeter;

(c) A globally distributed set of gauges for sampling at the margin of the altimeter (including coastal regions and high latitudes);

(d) Geodetic positioning to improve reference levels of *in situ* gauges;

(e) Improvements in the World Weather Watch Network to address small island developing States meteorological data gaps.